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DRAFT FINAL

ADDENDUM TO FINAL PHASE I RFI/RI WORK PLAN

Surface Soil and Asbestos Disposal Area Characterization Plan

Rocky Flats Plant
Present Landfill (IHSS 114) and
Individual Hazardous Substance Site (IHSS 203)

(Operable Unit No. 7)

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant
Golden, Colorado

January 1993

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REVIEWED FOR CLASSIFICATION/UCNI
BY G. T. Ostdiek
DATE 3-31-93

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1.0 INTRODUCTION

In order to comply with agency guidance and requirements of Comprehensive Environmental Response, Compensation and Liability (CERCLA) embodied in the Interagency Agreement (IAG) (DOE 1991), the Human Health Risk Assessment (HHRA) for Operable Unit No. 7 (OU7) must evaluate human exposure to contamination without assuming the existence of institutional controls typically emplaced during landfill closure to fulfill Resource Conservation and Recovery Act (RCRA) regulations contained in 40 CFR 265, 40 CFR 257, 40 CFR 61, and 40 CFR 763. The OU7 HHRA will evaluate human health risks for a variety of exposure pathways, including direct contact, incidental ingestion, and inhalation given a variety of current and future onsite and offsite land use exposure scenarios.

To perform these evaluations, surface soil characterization is required for all Individual Hazardous Substance Sites (IHSSs) and other potentially contaminated areas within OU7. However, the Phase I RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plan for OU7 (EG&G 1991a) does not specify surface soil sampling for IHSS 114, the Present Landfill. In addition, recently obtained information indicates that past waste operations in the vicinity of IHSS 114 included the disposal of asbestos in trenches that were backfilled or covered with soil. Therefore, the presence or absence of asbestos contamination within surface soils at OU7 has not been determined or addressed in the work plan. To address these data needs, this sampling and analysis plan has been prepared to characterize surface soils and the asbestos disposal areas.

Section 2.0 of this document provides background information for OU7, a site conceptual model, and a discussion of data quality objectives (DQOs) for the surface soil and asbestos characterization program. Section 3.0 presents the sampling and analysis plan (SAP) and Section 4.0 discusses the Quality Assurance/Quality Control (QA/QC) considerations. References are presented in Section 5.0. This technical memorandum supplements the Phase I RFI/RI Work Plan for OU7 (EG&G 1991a). Data generated by the SAP will be adequate to characterize (1) potential contamination in surface soil within and adjacent to IHSS 114 and (2) the nature and extent of the asbestos disposal areas. This information will be suitable for use in the HHRA. Exposure to the soil and associated risks will be presented in the OU7 Baseline Risk Assessment.

2.0 DQO PROCESS AND OBJECTIVES

The primary objective of an RFI/RI is to collect data needed to determine the nature, distribution, and exposure routes of contaminants in support of the baseline risk assessment and the evaluation of remedial alternatives. DQOs are qualitative and quantitative statements that specify the quality of the data required to support an RI (EPA 1987). DQOs should be specified for each data collection activity, and the work should be conducted and documented in a manner that ensures that sufficient data of known quantity and quality are collected to support remedial action selection decisions (EPA 1987). DQOs for the surface soil sampling program have been developed using the three-stage process described in the following sections.

2.1 Stage 1 - Decision Types

Stage 1 of the DQO process involves the identification and involvement of data users (Section 2.1.1), development of the site conceptual model (Section 2.1.3), and definition of objectives and decision types that will be made during the RFI/RI process. An example of the latter includes determining whether remediation is necessary and, if so, what type (Section 2.1.4). Existing data must also be evaluated during this stage to aid in the DQO process in order to develop a conceptual model of the study area (EPA 1987). The conceptual model identifies suspected sources, contaminant pathways, and potential receptors. The primary focus of the activities conducted during Stage 1 of the DQO process is to identify data gaps.

2.1.1 Data Users

Physical and chemical data from the surface soils will be used by the U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), Colorado Department of Health (CDH), and the Natural Resource Trustee for site characterization, preparation of the baseline risk assessment, and (possibly) feasibility studies. The primary data users will be risk assessment scientists, statisticians, and feasibility engineers. Detailed information pertaining to remedial design or remedial action will be collected as needed.

2.1.2 Current Understanding of Site Conditions and Contamination

In accordance with the IAG (DOE 1991), the Phase I RFI/RI Work Plan for OU7 addresses characterization of source materials and soils, including (1) landfill waste and leachate at IHSS 114, (2) soils beneath the landfill potentially contaminated with leachate, (3) sediments and water in the East Landfill Pond, (4) potentially contaminated soils at IHSS 203, and (5) potentially contaminated soils in the vicinity of the East Landfill Pond where spray evaporation has historically occurred. These areas are shown in Figure 1.

Although the Phase I RFI/RI will obtain analytical data to characterize surface soil in IHSS 203 and adjacent to the East Landfill Pond, no representative analytical data currently exist that characterize surface material (upper two inches of the soil profile) within and adjacent to IHSS 114.

Improvements to IHSS 114 proposed in the Engineering Operation Plan for RFP Landfill, Authorization Number 422215 include an interim soil cover in partial fulfillment of the landfill cover requirements stated in 6 CCR-1007-2, Regulations Pertaining to Solid Waste Disposal Sites and Facilities. Interim soil cover material currently stockpiled and being used at the landfill was obtained from an offsite location believed to be non-contaminated. However, no data exist to characterize this cover material or to demonstrate the absence of contamination.

Existing analytical data characterizing the daily soil cover and fill material underlying the interim soil cover were presented in the Phase I RFI/RI Work Plan for OU7 (EG&G 1991a). These data are limited to chemical analysis of borehole samples obtained during drilling of Wells B106089, B206189, B206389, and B206789, which are located within IHSS

114. However, these data are not considered appropriate for use in the HHRA, for two reasons. First, the borehole samples are composites of soil collected from depths of 0.0 to 6.0 feet. Second, the sampled materials are buried beneath the interim soil cover and thus do not represent the wind-suspended material considered in the HHRA for the onsite and offsite land use exposure scenarios.

In addition, recently obtained information indicates that past waste operations in the vicinity of IHSS 114 included the disposal of asbestos in trenches that were backfilled or covered with soil. Figure 1 shows the locations of the disposal trenches based on aerial photographs taken between 1970 and 1980 (EG&G 1982, 1983, 1985, 1988, and 1989). The dates of disposal activity and trench locations documented by the photographs are consistent with information provided by EG&G Waste Operations personnel involved with the disposal activity. Therefore, the presence or absence of asbestos contamination within surface soils at OU7 has not been determined or addressed in the work plan.

2.1.3 Conceptual Site Model

An integral part of the DQO process is the development of a conceptual model to identify contaminant pathways to support data collection needs. Figure 2 illustrates the site conceptual model for OU7 portraying the pathways for surface-soil contaminant migration.

Contaminants in surface soils may potentially be or released by volatilization (volatile organics), resuspension of fugitive (nonvolatile contaminants), infiltration or percolation into groundwater, runoff into surface water, and uptake by biota (Figure 2).

Exposure to contaminants in surface soils can occur through multiple pathways; the actual pathways of significance will be determined during the risk assessment. In accordance with the IAG, the Phase I HHRA will evaluate exposure via the air and direct contact pathways. A subsequent Phase II RFI/RI and associated HHRA will investigate the nature and extent of contamination in surface water, groundwater, leachate, and biota and evaluate potential contaminant migration pathways. The potential receptor populations for each Phase I exposure pathway will be determined during the Phase I HHRA.

2.1.4 Objectives/Approach

"Near-surface" soil samples will be collected in areas within and adjacent to IHSS 114 to characterize shallow contamination, if present. The objective of the surficial soil characterization program is to provide representative physical and chemical data that describe soils and can be used to:

(1) Develop source terms for exposure pathways evaluated in the risk assessment

(2) Compare with relevant health-based criteria

(3) Evaluate potential risks from inhalation of resuspended particulates

(4) Evaluate potential risks from incidental ingestion of and dermal contact with contaminated soils

(5) Evaluate the conceptual model

(6) Evaluate whether remedial/corrective action may be required and, if so, what type

2.2 Stage 2 - Data Uses/Needs

Stage 2 of the DQO process involves the identification of data uses and types as well as data quality and quantity needs to meet the objectives specified in Stage 1. It also includes the selection of the sampling approach and the analytical options for the task, including the economic and technical feasibility of the technique chosen. Finally, DQOs must address the precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters of the planned activities (EPA 1987).

2.2.1 Data Uses

In order to ensure that the sampling effort will address the objectives outlined during Stage 1 of the DQO process, the anticipated uses for the collected data must be specifically stated. Data collected during the surficial soil sampling activities will be used to characterize surface soil contamination within and adjacent to IHSS 114 and evaluate remedial/corrective action alternatives, if needed. Surficial soil sampling within IHSS 203 and adjacent to the East Landfill Pond has already been specified in the OU7 work plan. The information will be used to evaluate any potential threat posed to public health and the environment. Specifically, surface soil contamination will support development of source terms for complete human health exposure pathways.

2.2.2 Data Types

Upon identification of the intended uses and users of the data to be collected, specific data needs can be developed. This is an integral step in the DQO process. Data types include general categories such as background and investigative samples as well as more specific information such as proposed analytical parameters. The analytical requirements are dictated by the intended use of the data (EPA 1987).

2.2.3 Data Quality

<u>Analytical Level</u>

Analytical methods and support levels must be evaluated during the development of site-specific DQOs. The parameters for which the analytical method is valid, its limitations, and any special considerations that will affect data quality must be understood in order to select an appropriate method for specific uses. The analytical method options available to support data collection activities are presented in five general levels (EPA 1987). These levels are distinguished by the types of technology and documentation used and their degree of sophistication.

- LEVEL V -- Non-standard methods. Analyses that may require method modification and/or development. These data can be used for toxicology applications.

- LEVEL IV -- Contract Laboratory Program (CLP) Routine Analytical Services (RAS). This level is characterized by rigorous QA/QC protocol and documentation and provides qualitative and quantitative analytical data. These data can be used for toxicology applications.

- LEVEL III -- Laboratory analyses using methods other than CLP RAS. This level is used primarily to support engineering studies and risk assessments using standard EPA-approved procedures. Some procedures may be equivalent to CLP RAS without the CLP requirements for documentation.

- LEVEL II -- This level is characterized by the use of portable analytical instruments that can be used onsite or in mobile laboratories stationed near a site. This level is appropriate for determining presence or absence of contaminants, determining relative concentrations, and screening samples.

- LEVEL I -- This level is characterized by the use of portable instruments that can provide real-time data to assist in the optimization of sampling point locations.

Soil chemistry data derived from the proposed surface soil sampling and analysis program at OU7 will be used, in part, to evaluate any human health risks posed by contamination. Toxicological interpretation of soil chemistry requires sufficient documentation to allow for data verification. LEVEL V and LEVEL IV analytical reports provide this documentation; LEVEL III analytical procedures do not. Therefore, soil samples collected as part of this plan will be subjected to LEVEL IV analytical procedures and reporting requirements.

Detection Limits

The detection/quantitation limits for soil analyses are specified in the General Radiochemistry and Routine Analytical Services Protocol (GRRASP) (EG&G 1991b). Asbestos will be analyzed by polarizing light microscopy in accordance with EPA 40 CFR Part 763.115, with results reported in volume percent as estimated by the laboratory analyst. Detection/quantitation limits are discussed further in Section 3.1.3.

Background Samples

Representative background analytical data are necessary for meaningful interpretations of surface soil data at OU7. Background data will determine the naturally occurring spatial variability and concentration levels of a constituent. Background surface soil data will be compared to data from OU7 to determine the likelihood that concentrations of chemicals or elements in surficial soils, particularly those that are naturally occurring, represent contamination related to the operable unit. Background sampling is discussed in Section 3.1.3.

2.2.4 Data Quantity

The number of samples required to provide representative chemical data can be determined using a variety of approaches. When existing data are available, statistical techniques may be utilized to determine the number of samples required to meet the program objectives (EPA 1987). No representative chemical data are available for statistically determining sample numbers and locations. Therefore, Section 3.0 provides the approach for systematically identifying the selected sample locations and thus, the number of samples collected.

2.2.5 PARCC Parameters

The PARCC parameters are indicators of data quality. Precision is a quantitative measure of the reproducibility of the data under a given set of conditions and may be determined by collecting field duplicate (replicate) samples. Accuracy measures the bias in a sampling program. Sampling accuracy can be assessed through the analysis of laboratory QC samples and matrix spikes. Representativeness assesses the degree to which a data set typifies the study area. This criterion is best addressed by ensuring that the SAP justifies sampling locations and that a sufficient number of samples are collected. Completeness is defined as the percentage of valid measurements, while comparability is a qualitative indicator of the degree to which newly collected data can be compared with previously collected data. PARCC parameters for the surficial soil sampling program are discussed in Section 3.0.

2.3 Stage 3 - Documentation

Stage 3 results in the description of the procedures that will be implemented to obtain data of acceptable quality and quantity to make the required decisions. Through the implementation of the DQO process, components required for completion of Stage 3 should be available. The SAP presented in Section 3.0 describes the data collection program for the surface soil sampling task. The plan discusses the protocols for sample collection, including the types, locations, and frequency of samples to be collected. Section 4.0 presents QA/QC considerations.

3.0 SAMPLING PLAN OBJECTIVES AND APPROACH

3.1 Surface Soil Sampling and Analysis

The principal objective of the soil sampling plan is to estimate contaminant concentrations using statistical parameters such as the mean, variance, and confidence intervals so that exposure and source term estimates can be computed. The average human health and environmental risks for each contaminant can then be estimated from the upper limit of the 95 percent confidence interval of the mean (EPA 1989). This objective will support the baseline risk assessment, which will evaluate exposure scenarios such as incidental ingestion, inhalation of resuspended particulates, and dermal contact. A secondary objective is to demonstrate that soil cover material obtained from an offsite location is not contaminated.

3.1.1 Sample Numbers and Locations

The surface soil sampling plan has been designed so that (1) samples are collected in a uniform manner and (2) the analytical results represent all of IHSS 114 and adjacent areas where asbestos disposal occurred. Sample locations will be determined systematically using methods discussed in Gilbert (1987). This approach is valid because spatial trends in contaminant distribution are not expected and because there is an equal likelihood that human exposure will occur at any location within the area of interest. Spatial trends in contaminant distribution are not expected because (1) the interim soil cover material has been fully mixed during excavation, stockpiling, and grading and (2) the asbestos material was disposed in trenches at discrete locations. To define the sample locations, a uniform grid consisting of 30 rectangular cells was oriented to provide complete coverage of the areas of interest. Samples will be collected from a target area (polygon) located at each of the 20 nodes defined by the grid (Figure 3).

The polygon size selected for sampling considered the "exposure unit" concept of Neptune and Blacker (1986) and the expected size of a target area of contamination. Neptune and Blacker identify an area of 5,000 square feet as a reasonable approximation of the area of a residential yard (an exposure unit). At each grid node, a 100-foot by 50-foot polygon represents the sampling area. These polygons are appropriately sized for the onsite exposure scenarios considered in the HHRA. Collection of a composite surface soil sample from within each of these polygons will be adequate to detect contamination that may be present.

Selection of the polygon size (100 feet by 50 feet [5,000 square feet]) also considers the expected size of a target area of contamination. If offsite soils were contaminated, this contamination would have been dispersed during emplacement and grading of the interim soil cover materials. If asbestos were exposed by removal of the overlying soil cover, environmental transport processes would disperse these contaminants. Therefore, a target area of contaminated soil could conceivably be larger than 100 feet by 50 feet or, if smaller, could be identified using the compositing method.

One composite soil sample will be taken from each polygon selected for sampling. The compositing method applicable for systematically selected, equal-size sampling units is discussed in Gilbert (1987). Discrete samples will be taken from the corners and center of the polygon and will be composited (Figure 4). The Rocky Flats Method of surficial soil sampling will be used to collect "discrete" samples, although the method actually produces a local area composite. The method consists of sampling two 1-square-meter areas or plots placed 1 meter apart. The method utilizes a soil sampling jig with a sampling configuration of 10 by 10 by 5 centimeters deep. This method is described in detail in EMD Operating Procedures, Manual No. 5-21000-OPS-GT, Volume III: Geotechnical, GT.8 (EG&G 1991c). The subsamples will be collected and composited into one sample with a total sample volume of 25,000 cm^3. Lithologic descriptions of the sample will also be recorded.

Twenty polygons (i.e., composite samples) within IHSS 114 will be sampled to characterize the interim soil cover material. As a conservative approach, biased sampling will also be performed in the two additional polygons identified in Figure 3. Surficial soils in these areas are potentially contaminated with asbestos buried at shallow depths. The types and locations of the QC samples are discussed in Section 4.0.

The northwestern corner of each sample location polygon will be surveyed and identified with a marked steel post. The subsample locations will be approximately located using a hand-held compass and tape measure.

3.1.2 Background Surface Soil Sampling

Background values for surficial soils will be based on data from samples collected as part of the agency-approved Surface Soil Sampling and Analysis Plan presented in the Addendum to the Final Phase III RFI/RI Work Plan, Technical Memorandum 5, Surface Soil Sampling and Analysis Plan for Operable Unit No. 1, 881 Hillside Area (EG&G 1992). This document discusses the statistical basis for the number and location of samples and the procedures for calculating statistically based background concentrations. For the Phase III RFI/RI for OU1, 881 Hillside Area, surface soil samples have been collected in areas west and north of the Rocky Flats Plant in order to characterize background conditions.

Statistical techniques will be employed to determine whether the concentrations of a chemical in surface soil from OU7 differ significantly from the background values for that chemical.

3.1.3 Analysis Plan

The proposed analytical program for surface soils at OU7 is presented in Table 1, which is consistent with Table 7-1 in the Phase I RFI/RI Work Plan for OU7. All surficial soil samples will be analyzed for the suite of analytes listed in Table 1 to ensure data comparability with other surface soil samples collected within OU7. As indicated, the list is comprehensive to include all expected contaminant classes (including Target Analyte List [TAL] metals, Target Compound List [TCL] semi-volatile organics, inorganics, and radionuclides) based on the disposal history for the site. VOCs and acid extractables are not included because these classes of compounds are not likely to be present in surface soils. Particle size and bulk density analyses will also be conducted to physically characterize the surface soil.

Radionuclide analyses will be performed in accordance with the methods referenced in the GRRASP. Organic and metal analyses, as well as all additional analyses excluding asbestos, will be performed using CLP RAS as specified in the GRRASP. Asbestos will be analyzed by polarizing light microscopy in accordance with EPA 40 CFR Part 763.115, and results will be reported in volume percent as estimated by the laboratory analyst. Detection limits for asbestos are approximately 1 percent for analysis by polarizing light microscopy. Wet sieving and hydrometer tests will be performed for particle-size analyses.

Background values for all chemical analytes except asbestos were determined for the OU1 Phase III RFI/RI. All detectable asbestos (> 1 volume percent) will be considered above the background level because asbestos does not occur naturally in the geologic material used for the interim soil cover. Surficial soil samples containing detectable asbestos will be considered potentially contaminated.

3.2 Asbestos Disposal Characterization

The primary objectives of the asbestos characterization program are to determine (1) the presence or absence of asbestos in surface soil and (2) the areal and vertical extent of the asbestos disposal trenches. The sampling and analysis program designed to determine the presence or absence of asbestos in surficial soils has already been presented. This section addresses characterization of the areal and vertical extent of disposal.

Nonintrusive and minimally intrusive techniques will be utilized to verify the areal and vertical extent of asbestos disposal areal. EG&G Waste Operational personnel have posted signs that mark the appropriate areal limits of the disposal trenches. Geophysical methods may be used to evaluate the areal and vertical extent of the asbestos disposal trenches. Ground penetrating radar (GPR), electromagnetic (EM) conductivity, and electrical resistivity (the inverse of EM conductivity) will be evaluated for applicability to the anticipated site conditions at OU7 and their success in locating asbestos disposal areas at other sites. This evaluation will include review of GPR and EM work previously performed at OU7 to locate the groundwater intercept system (EG&G 1991d and 1991e, respectively), existing logs of boreholes located in the vicinity of the asbestos disposal trenches, and literature regarding application of these methods at other sites. Up to two applicable geophysical methods may be selected for investigation of the trenches. By using two distinct methods for geophysical investigation, the study is more likely to yield interpretable data.

The vertical depth of the disposal trenches will also be evaluated using cone penetrometer testing (CPT). CPT provides information regarding subsurface materials types and depths. Electronic sensors at the tip and side of the CPT probe measure penetration resistance and side friction of the subsurface materials penetrated. Penetration resistance and side friction are expected to be different for asbestos and geologic materials, making the CPT an appropriate tool for identifying the base of the disposal trenches. The number and locations of CPT sites will be determined on the basis of the results of the geophysical surveys and/or evaluation of aerial photographs. During CPT, attempts will be made to sample suspected asbestos-bearing materials for laboratory analysis.

3.3 Data Management and Reporting

The data management and reporting requirements specified in Section 7.5 of the OU7 work plan will be followed. To summarize briefly, field and laboratory data collected during the Phase I RFI/RI will be incorporated into the Rocky Flats Environmental Data System (RFEDS). RFEDS is used to track, store, and retrieve project data. Data will be input to the RFEDS via diskettes subsequent to data validation as outlined in the ER Program Quality Assurance Project Plan (QAPjP) (EG&G 1991f). Hard copy reports will then be generated from the system for data interpretation and evaluation.

4.0 QUALITY ASSURANCE (QA)/QUALITY CONTROL (QC)

The SAP addresses the procedures for the proposed field activities as well as the proposed analytical suite for samples collected during the surface soil sampling program. A QAPjP is an element of the SAP that identifies QA objectives for sample collection, analytical procedures and calibration, and data reduction, validation, and reporting. The QAPjP, in conjunction with Standard Operating Procedures (SOPs), complete the SAP. The ER Program QAPjP and the Rocky Flats EMD SOPs have been prepared by EG&G and submitted to the EPA and the Colorado Department of Health for review and comment. All field and analytical procedures will be performed in accordance with the methods described in the QAPjP, SOPs, Section 7.4 (Sample Analysis), Section 7.5 (Data Management and Reporting Requirements), Section 7.6 (Field QC Procedures), and Section 10.0 (Quality Assurance Addendum) of the OU7 Phase I RFI/RI Work Plan.

QC samples will be collected in conjunction with the surficial soil investigation samples to provide information on data quality. Equipment rinsate blanks, field duplicates, trip blanks laboratory blanks, laboratory replicates, and laboratory matrix spike and matrix spike duplicates are the commonly collected QC samples. Trip blanks generally pertain to volatile organic analyses, which will not be performed on the samples collected during the surface soil sampling program, and are therefore not discussed further.

Rinsate blanks will be collected by pouring distilled/de-ionized water through decontaminated sample collection equipment and submitting the sample for the same analyses as the investigative samples. Rinsate blanks monitor the effectiveness of the equipment decontamination procedures. Field duplicates will be collected and analyzed to provide information regarding the natural variability of the sampled media as well as to evaluate analytical precision. A split of the composited sample will be performed to obtain the field duplicate. Table 2 presents the suggested guidelines for collection of field QC samples (EPA 1987) and is consistent with Table 7-6 in the OU7 work plan and suggested guidelines presented in the QAPjP. Based on a proposed total of 22 samples to be collected, the number and type of QC samples for this SAP are indicated in Table 2.

Laboratory blanks and replicates test analytical procedures and conditions. Laboratory matrix spikes and matrix spike duplicates measure analytical accuracy by providing data on matrix interferences and components interfering with instrument responses. The frequency of collection and analysis of laboratory QC samples is dictated by the prescribed analytical method as cited in the GRRASP. The precision and accuracy standards detailed in the proposed analytical method are sufficient for the project.

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Table 1: Phase I Soil Sampling Parameters and Detection/Quantitation Limits

Target Analyte List - Metals	Detection Limits* Soil (mg/kg)
Aluminum	40
Antimony	12
Arsenic	2
Barium	40
Beryllium	1.0
Cadmium	1.0
Calcium	2000
Cesium	200
Chromium	2.0
Cobalt	10
Copper	5.0
Cyanide	10
Iron	20
Lead	1.0
Lithium	20
Magnesium	2000
Manganese	3.0
Mercury	0.2
Molybdenum	40
Nickel	8.0
Potassium	2000
Selenium	1.0
Silver	2.0
Sodium	2000
Strontium	40
Thallium	2.0
Tin	40
Vanadium	10.0
Zinc	4.0

Semi-volatiles	Quantitation Limits* Soil µg/Kg
Phenol	330
bis(2-Chloroethyl)ether	330
2-Chlorophenol	330
1,3-Dichlorobenzene	330
1,4-Dichlorobenzene	330
Benzyl alcohol	330
1,2-Dichlorobenzene	330
2-Methylphenol	330
bis(2-Chloroisopropyl)ether	330
4-Methylphenol	330
N-Nitroso-di-n-propylamine	330
Hexachloroethane	330
Nitrobenzene	330
Isophorone	330
2-Nitrophenol	330
2,4-Dimethylphenol	330
Benzoic Acid	1600
bis(2-Chloroethoxy)methane	330
2,4-Dichlorophenol	330
1,2,4-Trichlorobenzene	330
Naphthalene	330
4-Chloroaniline	330
Hexachlorobutadiene	330
4-Chloro-3-methylphenol (para-chloro-meta-cresol)	330
2-Methylnaphthalene	330
Hexachlorocyclopentadiene	330
2,4,6-Trichlorophenol	330
2,4,5-Trichlorophenol	1600
2-Chloronaphthalene	330
2-Nitroaniline	1600

Semi-volatiles (cont'd.)	Quantitation Limits* Soil µg/Kg
Dimethylphthalate	330
Acenaphthylene	330
2,6-Dinitrotoluene	330
3-Nitroaniline	1600
Acenaphthene	330
2,4-Dinitrophenol	1600
4-Nitrophenol	1600
Dibenzofuran	330
2,4-Dinitrotoluene	330
Diethylphthalate	330
4-Chlorophenyl-phenylether	330
Fluorene	330
4-Nitroaniline	1600
4,6-Dinitro-2-methylphenol	1600
N-nitrosodiphenylamine	330
4,-Bromophenyl-phenylether	330
Hexachlorobenzene	330
Pentachlorophenol	1600
Phenanthrene	330
Anthracene	330
Di-n-butylphthalate	330
Fluoranthene	330
Pyrene	330
Butylbenzylphthalate	330
3,3-Dichlorobenzidine	660
Benzo(a)anthacene	330
Chrysene	330
bis(2-Ethylhexyl)phthalate	330
Di-n-octylphthalate	330

Semi-volatiles (cont'd.)	Quantitation Limits* Soil µg/Kg
Benzo(b)fluoranthene	330
Benzo(k)fluoranthene	330
Benzo(a)pyrene	330
Indeno(1,2,3-cd)pyrene	330
Dibenzo(a,h)anthracene	330
Benzo(g,h,i)perylene	330

Radionuclides	Required Detection Limits* Soil (pCi/g)
Gross Alpha	4 dry
Gross Beta	10 dry
Uranium 233 & 234, 235, and 238 (each species)	0.3 dry
Americium 241	0.02 dry
Plutonium 239 & 240	0.03 dry
Cesium 137	0.1 dry
Strontium 89 & 90	1 dry

Other Chemical Parameters	Quantitation Limits* Soil
Carbonate	10 µg/g
Total Organic Carbon	0.05 %
Asbestos	1% (volume percent)**
Specific Conductance	1.0 µS
pH	0.20 pH unit

Physical Parameters

Bulk Density	N/A
Particle Size Analysis	N/A

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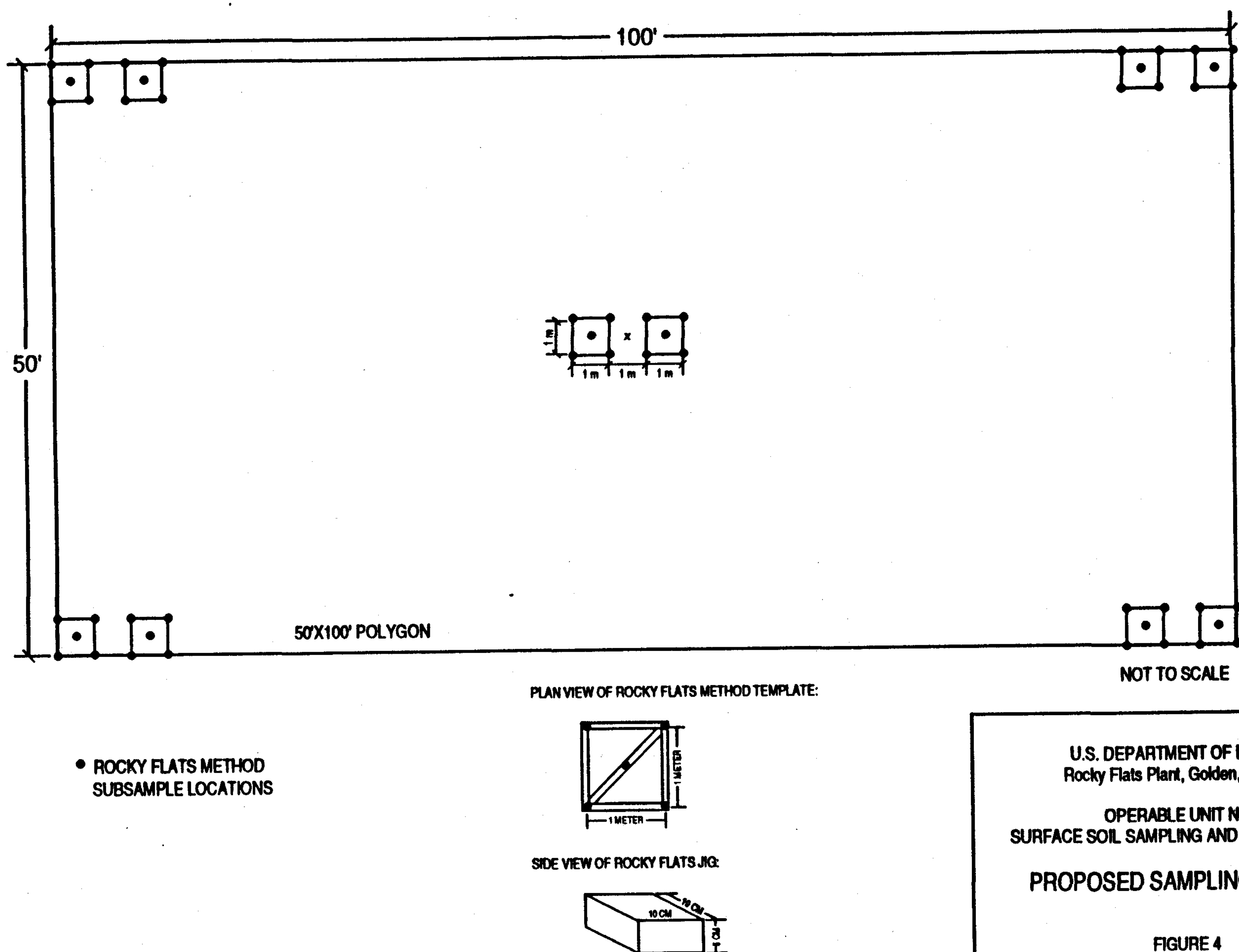
*Detection and quantitation limits are highly matrix dependent. The limits listed here are the minimum achievable under ideal conditions. Actual limits may be higher.

**Achievable detection limit based on using polarizing light microscopy.

Table 2: Field QC Sample Frequency

Sample Type	Type of Analysis	Solids	Number of QC Samples
Duplicates	Organics	1/10	NA
	Inorganics	1/10	3
	Radionuclides	1/10	3
	Asbestos	1/10	3
Field Preservation Blanks	Organics	NA	NA
	Inorganics	NA	NA
	Radionuclides	NA	NA
	Asbestos	NA	NA
Equipment Blanks	Organics	1/20	NA
	Inorganics	1/20	2
	Radionuclides	1/20	2
	Asbestos	1/20	2
Trip Blanks	Organics	NR	NR
	Inorganics	NR	NR
	Radionuclides	NR	NR
	Asbestos	NR	NR

NA = Not Applicable
NR = Not Required
1/10 = one QC sample per ten samples collected



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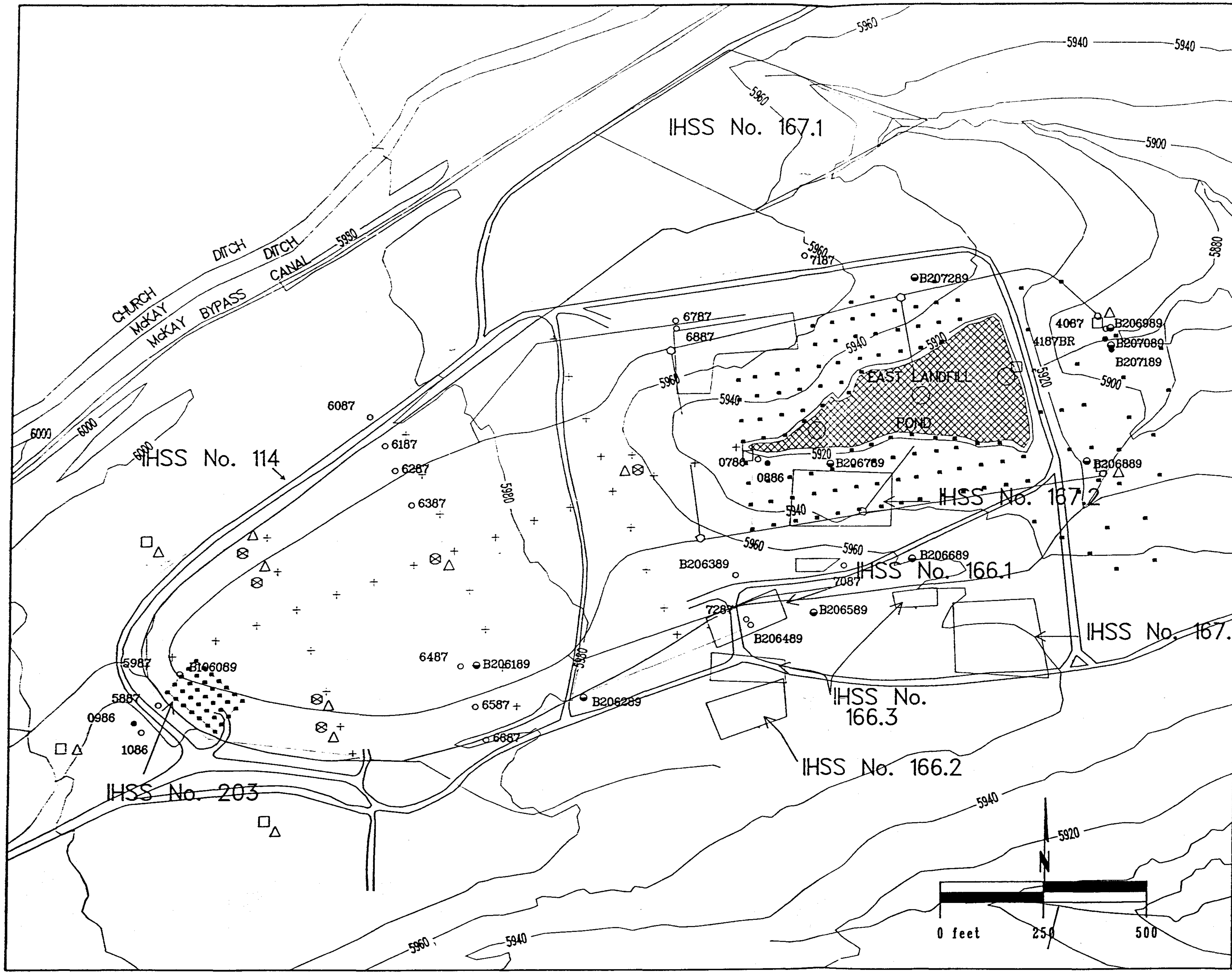
OPERABLE UNIT NO. 7
SURFACE SOIL SAMPLING AND ANALYSIS PLAN

PROPOSED SAMPLING SCHEME

FIGURE 4

December, 1992

M51/ES/Sampling.mdw/12-11-92



EXPLANATION

- △ PROPOSED BORING TO BE SAMPLED AND GROUTED AFTER COMPLETION
- ⊗ PROPOSED MONITORING WELL LOCATIONS
- + PROPOSED CPT LOCATIONS
- □ PROPOSED CLUSTER MONITORING WELL LOCATIONS
- ○ PROPOSED SEDIMENT SAMPLING LOCATIONS
- · EXISTING SOIL SAMPLING LOCATIONS
- □ SURFACE WATER SAMPLING LOCATIONS
- APPROXIMATE EXTENT OF ASBESTOS DISPOSAL
- OU7 IHSS BOUNDARIES
- OU6 IHSS BOUNDARIES
- LANDFILL STRUCTURES
- DIRT ROADS
- STREAMS, DITCHES, DRAINAGE FEATURES
- ○ EXISTING ALLUVIAL WELLS
- ◒ EXISTING WEATHERED BEDROCK WELL
- ● EXISTING UNWEATHERED BEDROCK WELL

CONTOUR INTERVAL = 20 FEET

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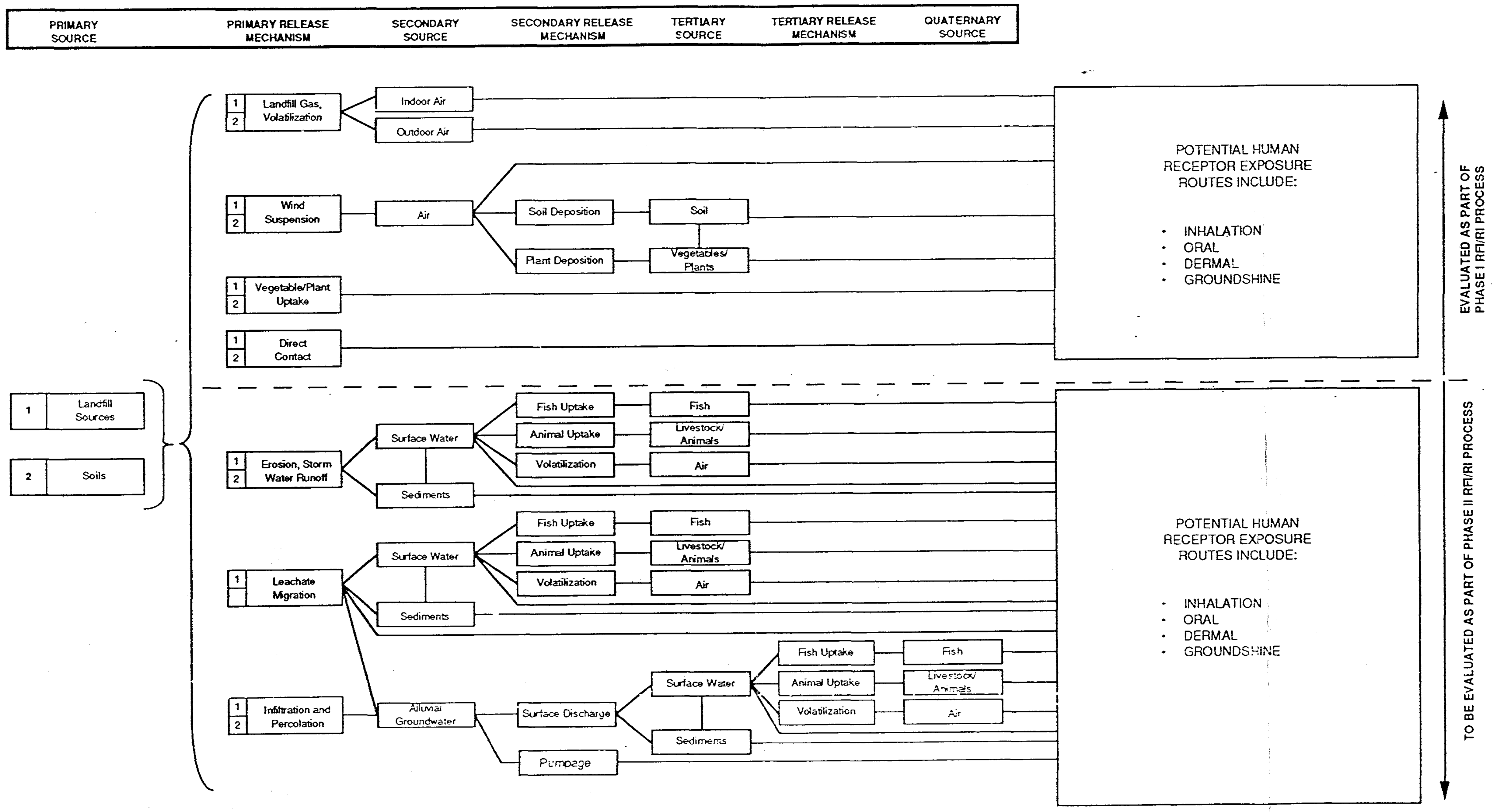
PROPOSED SAMPLE
LOCATION POINTS
PHASE 1 RFI/RI
OU 7

Figure 1



Legend

S Significant Potential Exposure Pathway (Conceivable and Relatively More Important)
I Insignificant Potential Exposure Pathway (Conceivable, Though Not As Important)
X Negligible and/or Incomplete Exposure Pathway (Unlikely to Occur)

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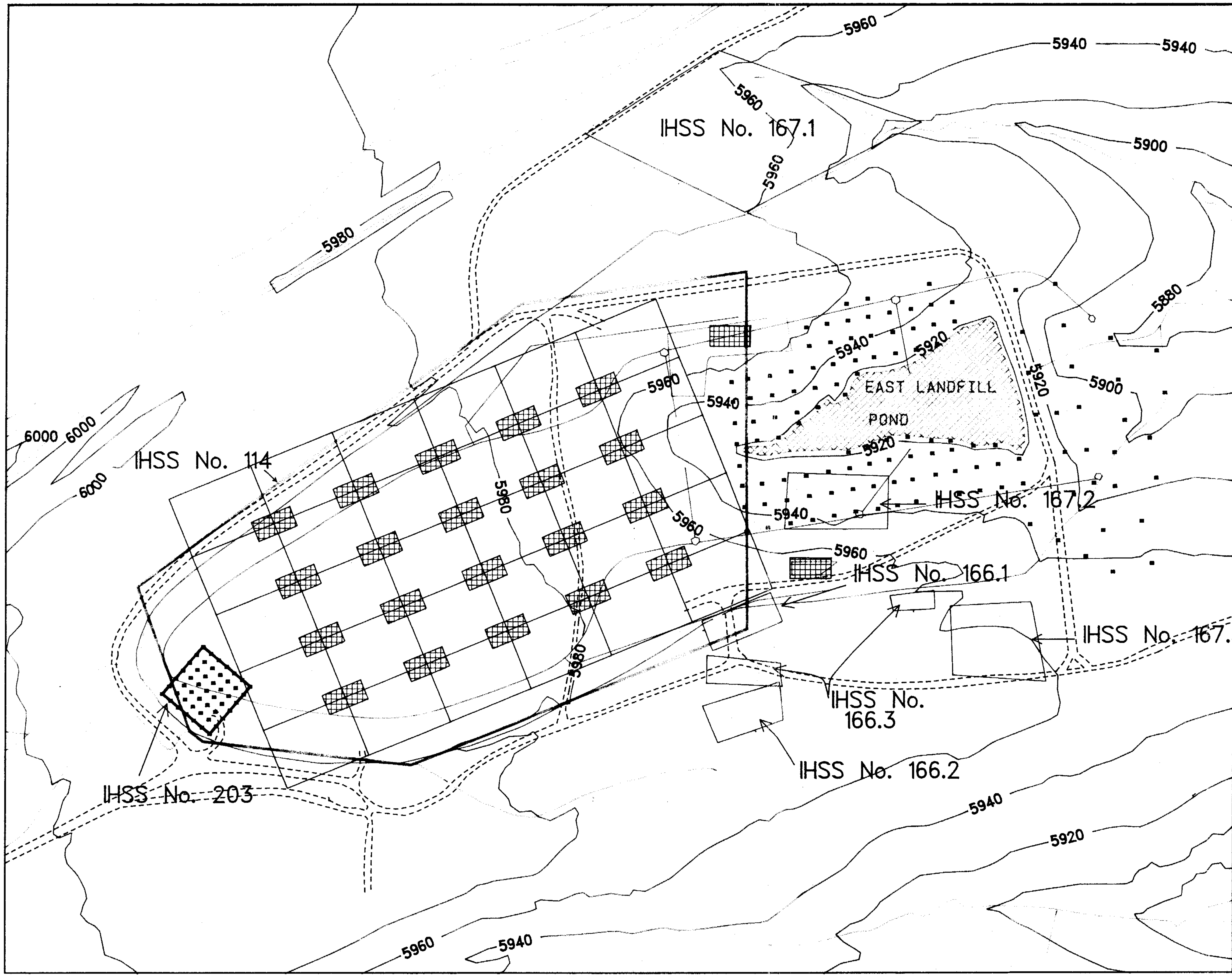
OPERABLE UNIT 7
PHASE I RFI/RI EXPOSURE ASSESSMENT

Figure 2 Conceptual Site Model

M51\ES\EXPOSURE PATH-ES.MDW/12/10/92



EXPLANATION

APPROXIMATE EXTENT OF ASBESTOS DISPOSAL

OU7 IHSS BOUNDARIES

OU6 IHSS BOUNDARIES

LANDFILL STRUCTURES

DIRT ROADS

STREAMS, DITCHES, DRAINAGE FEATURES

EXISTING SURFICIAL SOIL SAMPLING LOCATIONS

TYPICAL RESIDENTIAL LOT

0 feet 250 500

CONTOUR INTERVAL = 20 FEET

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Surficial Soil Sampling Locations to Characterize Present Landfill and Asbestos Disposal Areas for the OU7 Human Health Risk Assessment

Figure 3